Amendments to the Claims

This listing of claims will replace all prior listings of claims in the application.

Listing of Claims

1. (Currently amended) Method of open ~~and /~~ or closed-loop control of a welding tong movement by ~~means of~~ a welding tong drive ~~(1)~~, comprising at least one primary and one secondary drive device ~~(2, 3)~~, wherein the primary drive device ~~(2)~~ moves at least two welding tong limbs ~~(5, 6)~~ with welding electrodes ~~(7, 8)~~ from essentially opposite sides towards a welding object ~~(9)~~ and presses ~~them~~the at least two welding tong limbs with a predetermined compressive force onto ~~it~~the welding object, and wherein the secondary drive device ~~(3)~~ during its actuation varies a spatial orientation of the welding tongs ~~(4) and in particular of the welding tong limbs (5, 6), with~~, the method comprising the following steps:

a) approach of the welding tongs ~~(4)~~ to a ~~certain~~ predetermined spatial point relative to the welding object;

b) holding of the welding tongs ~~(4)~~ in a fixed spatial orientation during the approach;

c) actuation of the secondary drive device ~~(3)~~ up to ~~the~~ contacting of the welding object ~~(9)~~ with at least one welding tong limb ~~(5, 6)~~ and acquisition of the contacting, and

d) after acquisition of the contacting, closure of the welding ~~tongs (4)~~tong limbs by the primary drive device ~~(3)~~ with ~~the~~ build-up of ~~an appropriate welding pressure~~a predetermined compressive force for welding.

2. (Currently amended) Method according to Claim 1, wherein in the approaching step ~~(a)~~ the welding tongs ~~(4)~~ are moved by ~~means of~~ a robot device ~~(10)~~ and during actuation of

the secondary drive device the welding tong limbs are in a fixed spacial relationship with respect to each other.

3. (Currently Amended) Method according to Claim 1, wherein at least one of the primary and ~~/ or~~ secondary drive devices ~~(2, 3) are~~is operated by an electric ~~motors~~motor.

4. (Currently Amended) Method according to Claim 2, wherein in the holding step ~~(b)~~ the secondary drive device ~~(3)~~ is supplied with current varying in level and direction to retain the welding tongs ~~(4)~~ in a rigid relative position with respect to the robot device ~~(10)~~ or to the welding object ~~(9)~~.

5. (Currently Amended) Method according to Claim 1, wherein after the step ~~(b)~~ and before the actuation step ~~(c), i.e.~~, and after termination of the approach towards the welding object ~~(9)~~, an applied holding current of the secondary drive device ~~(3)~~ is acquired ~~with its arithmetic sign~~.

6. (Currently Amended) Method according to Claim 5, wherein in the actuation step ~~(c)~~ the holding current is varied by a ~~certain~~predetermined contacting current level for the actuation of the secondary drive device ~~(3)~~ for establishing contact.

7. (Currently Amended) Method according to Claim 6, wherein the contacting current ~~value~~level is determined experimentally for essentially each spatial point.

8. (Currently Amended) Method according to Claim 6, wherein the contacting current ~~value~~level is selected ~~to be at least sufficiently high~~ to overcome friction forces occurring during the movement of the ~~respective used~~ welding tongs ~~(4)~~.

9. (Currently Amended) Method according to Claim 6, wherein the contacting current ~~value~~level is increased ~~briefly~~ by a specified factor to achieve an initial breakaway torque for initiating the movement of the welding tongs ~~(4)~~ by ~~means of~~ the secondary drive device ~~(3)~~.

10. (Currently Amended) Method according to Claim 9, wherein the contacting current ~~value~~level is increased for at least one of a ~~certain~~predetermined time and ~~/ or~~ a ~~certain~~predetermined movement displacement of the secondary drive device ~~(3)~~.

11. (Currently Amended) Method according to Claim 1, wherein ~~the~~ contacting of the at least one welding tong limb ~~(5, 6) occurs~~is detected by monitoring ~~the~~ current passed to the secondary drive device ~~(3)~~.

12. (Currently Amended) Method according to Claim 11, ~~characterised in that~~wherein the contacting is detected by acquiring a servo lag in the ~~monitored~~ current passed to the secondary drive device.

13. (Currently Amended) Method according to Claim 1, wherein the welding ~~pressure~~force in the closure step ~~(d)~~ is increased ~~to a few kN, in particular up~~ to about 5 kN.

14. (Currently Amended) Method according to Claim 1, wherein the welding tong limbs ~~(5, 6)~~ are opened by ~~means of~~ the primary drive device ~~(3)~~ before moving to a further welding point or after termination of welding and then the welding tongs ~~(4)~~ are moved by ~~means of~~ the secondary drive device ~~(3)~~ to a ~~specified~~ starting spatial point.

15. (Currently Amended) Method according to Claim 1, wherein deviations from specified spatial points of the welding object ~~(9)~~ or from ~~the~~ corresponding welding points

are acquired by ~~means of the~~an open ~~and /~~ or closed-loop control device ~~(11)~~ of at least one of the secondary drive device ~~(3) and / or of~~and the primary drive device ~~(2)~~ and are passed to an evaluation device ~~(12) in particular~~ for quality assurance.

16. (Currently Amended) Method according to Claim 1, wherein bodily changes to the welding electrodes ~~(7, 8)~~ and to parts of the welding electrodes due to wear, degrading of material, loss of a welding electrode or parts thereof ~~or similar effects~~ are acquired on contacting the welding object or contacting the welding tong limbs ~~(5, 6)~~ or the welding electrodes ~~(7, 8)~~ together by ~~means of the~~an open ~~and /~~ or closed-loop control device ~~(11)~~.

17. (Currently Amended) Method according to Claim 16, wherein ~~the~~a starting spatial point is corrected with regard to ~~the~~ bodily changes ~~and /~~ or the change is passed to ~~the~~an evaluation device ~~(12)~~.

18. (Currently Amended) Method according to Claim 1, wherein the secondary drive device ~~(3)~~ is swivelled by at least two single drives of the welding tongs ~~(4)~~ essentially within a hemisphere.

19. (New) A method of controlling welding tong movement for a welding tong of a welder, the welder comprising a primary drive device and at least one secondary drive device, wherein the primary drive device is connected to and is capable of moving at least two welding tong limbs of the welding tong relative to each other, wherein the secondary drive device during its actuation rotates the welding tong, comprising the steps of:

approaching the welding tong to a predetermined spatial point relative to the welding object;

holding the welding tong in a fixed spatial orientation during the approach;

actuating the secondary drive device to pivot the welding tong about a pivot axis to contact the welding object with one of said welding tong limbs;

maintaining said welding tong limbs in a fixed spatial relationship with respect relative to each other during the pivoting of the welding tong;

after the welding tong limb contacts the welding object, actuating the primary drive device to apply a closing force to each of the welding tong limbs so that the welding tong limbs of the welding tong close on the opposing outer surfaces of the welding object; and

applying a predetermined compressive force with the primary drive device between inwardly facing welding electrodes located on innerwardly oriented faces of the welding tong limbs and against the opposing outer surfaces of the welding object.

20. (New) The method of Claim 19, including the step of:

providing another secondary drive device, wherein said another secondary drive device moves the welding tong about a rotation axis that is transverse to the pivot axis of the welding tong, and

wherein the step of approaching the welding tong to the predetermined spatial point comprises operating a robot device to move the welding tong.